

KABANOV, A.Ya.

In close contact. Sov. profsoiuzy 7 no.17:17-18 S '59.  
(MIRA 12:11)

1. Direktor Ural'skogo alyuminiyevogo zavoda.  
(Aluminum industry) (Suggestion systems)

MOLCHANOV, Aleksandr Alekseyevich; CHUBAREVA, Vera Aleksandrovna;  
KABANOV, A.Ye., otv. red.

[Formation and growth of oak on cutovers in the forest-  
steppe] Formirovanie i rost duba na vyrubkakh v lesostepi. Moskva, Nauka, 1965. 254 p. (MIRA 18:9)



KABAKOV, B.D., doktor med.nauk (Leningrad, Nevskiy pr. d.32/34 kv.3);  
KLEMENTOV, A.V., kand.med.nauk

Removal of the parotid salivary glands in chronic inflammation of  
them. Vest.khir. no.6:64-66 '62. (MIRA 15:11)

1. Iz kliniki chelyustno-litsevoy khirurgii i stomatologii  
meditsinskoy ordena Lenina akademii imeni S.M. Kirova.  
(PAROTID GLANDS--EXCISION)

B/062/63/000/002/007/020  
B144/B186

**AUTHORS:** Voropayeva, T. N., Deryagin, B. V., and Kabanov, D. N.  
**TITLE:** Determination of the points of zero charge by the method of crossed polarized metallic threads  
**PERIODICAL:** Akademiya nauk SSSR. Izvestiya. Otdeleniye khimicheskikh nauk, no. 2, 1963, 257 - 263

**TEXT:** A new direct method is described for determining the points of zero charge in metals by measuring the force barrier preventing the contact of two polarized metal threads in an electrolyte. Two threads of Pt, Au, or Fe, 200 - 300  $\mu$  in diameter, were mounted orthogonally in a vessel in such a way that they could be brought into contact with the aid of a d-c motor. The vessel was partly filled with an electrolyte (KCl,  $MgSO_4$ ,  $H_2SO_4$ ). The metal threads could be polarized separately to any given potential by two Pt electrodes. The potential was measured using calomel with KCl solutions, and  $Hg-Hg_2SO_4$  with  $MgSO_4$  and  $H_2SO_4$  solutions as reference electrodes. The potential difference of 0.01 v between the two threads was nullified at the moment of contact and the two threads were separated again automatically.  
Card 1/2

Determination of the points...

S/062/63/000/002/007/020  
B144/B106

The angle of rotation was measured with a photorelay. The value of the force barrier was recorded on an electronic potentiometer at the moment of contact. The points of zero charge correspond to the minimum or zero values of this force barrier, as is shown by measurements at different potentials. The force barrier determined for Pt threads in KCl solution showed a distinct minimum at  $0.20 \pm 0.01$  v in 0.001 KCl, which became flatter in 0.01 KCl and disappeared completely in 0.1 N KCl. The electrolytes used with gold threads were  $10^{-3}$  N KCl and  $3 \cdot 10^{-4}$  N  $\text{La}(\text{NO}_3)_3$ . In both cases the minimum was observed at 0.05 v. For Fe threads, the minimum of the force barrier in  $10^{-2}$  N NaOH (Fe is passive) was at 0.34 v, in  $3 \cdot 10^{-3}$  N and  $10^{-2}$  N HCl (Fe is active) at -0.4 v. There are 3 figures and 1 table.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of Physical Chemistry of the Academy of Sciences USSR)

SUBMITTED: May 14, 1962

Card 2/2

FRUMKIN, A.N.; SHUMILOVA, N.A.; KABANOV, B.N.; LEVINA, S.D.

Revekka Khaimovna Burshtein; on her sixtieth birthday. Zhur.  
fiz. khim. 38 no.5:1390-1391 My '64.

(MIRA 18:12)

FRANKLIN, A.H.; FRANKLIN, I.H.; FRANKLIN, I.H.

Aleksandr Neofitovich Frankin, 1904-; on his service in the country.  
Shur.fiz.khim. 30 ya.10-2629-2633 C 1-1.

(1904-1917)



BAGOTSKIY, V.S., doktor tekhn.nauk (Moskva); BABANOV, B.M., prof. (Moskva)

High appreciation of the work of a scientist; on the 70th  
birthday of Academician Aleksandr Naumovich Franklin. Priroda  
55 no.1:106-107 Ja '66. (MIRA 19:1)

1ST AND 2ND CODES		PROCESS AND PROPERTY INDEX		3RD AND 4TH CODES	
CA		Electroplating wires and strips at high current densities. A preliminary communication. D. V. STEPANOV, B. N. KARANIK AND N. T. KUDRYAVTSEV. <i>Truz. vuz. Met.</i> 1950, 1181-8. Cold Zn plating has many advantages over the hot dip process, such as greater uniformity of the coating, steadiness of the bath, economy of Zn and easier control of the bath. The proposed methods of increasing the c. d. to hasten the process have serious drawbacks. The authors made about 300 expts. to find conditions essential for good results with high c. d. Circulation of the bath permits higher c. d. (200 to 400 amp./sq. dm.) than those used before. Different concns. of $ZnSO_4$ , $H_2SO_4$ , $H_2BO_3$ making up the bath were also studied, as well as the changes in the bath during the process and the suitable indicators. At 50 amp./sq. dm. it is necessary to add to a bath of 1000 l. 30 l. water, 1 kg. $H_2BO_3$ and 10 g. boric acid per hr. At 50 amp./sq. dm. the best temp. is 45°. At higher c. d. the temp. should be higher. The problem of cooling the electrolyte which is heated by the current is solved by the application of air stirring; a formula is developed by which the equilibrium temp. suitable for the process can be calculated. Tables show the change of voltage with temp. and with the distance between the electrodes and a set of optimum conditions at c. d. 50, 100 and 300 amp./sq. dm. J. C. TOLPIN		7	
ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION					
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• Electro-Capillary Phenomena and Wettability of Metals. II. Measurement of Contact Angles on Platinum, Zinc, Silver, Gallium, and Thallium Amalgams. A. Gornikhtaja and B. Kabany. (Zhurnal Fizicheskoy Khimii (J. Phys. Chem.), 1933, 4, (5), 539-537; also *Physikal. Z. Sowjetunion*, 1934, 6, 418-431).—[In Russian.] Contact-angles of bubbles of hydrogen on metals in electrolytes have been measured at different degrees of polarization. Curves for  $\sigma-\phi$  are given for liquid gallium and thallium amalgam and for solid platinum, zinc, silver, and mercury-coated platinum. The potentials corresponding with the maximum contact-angle (A) and with the maximum on the electro-capillary curve (B) are as follows:

Metal	Reduction	A	B
Mercury	$N-Na_2SO_3$ (neut)	0.56	0.48
Platinum	$O-1N-H_2SO_4$	0.40	0.48
Platinum + mercury	$N-Na_2SO_3$ (acid)	0.43	0.48
Silver	$N-KCl + N-HCl$	0.3	0.8
Gallium	$N-Na_2SO_3$ (acid)	1.2	0.93
Thallium amalgam		0.95	

For platinum and silver the maximum of the contact-angle curve lies close to the point of zero charge obtained by the adsorption method.—N. A.

Calculations for Electroplating Cells. B. N. Kabanov (*Khimich.*, 1933, 7, 41-45; *C. Ab.*, 1933, 29, 3607).—[In Russian.] Cf. Kabanov and Frumkin (*Z. physikal. Chem.*, 1933, [A], 186, 433-452) and Stepanov, Kabanov, and Kudriavtsev (*Met. Abs. (J. Ind. Metals)*, 1931, 67, 385). Procedures for wire plating with zinc, lead, and antimony are described. Mathematical formulae for the interrelation of various factors in the electroplating process are proposed.—S. G.

1st and 2nd. RESEARCH		PROCESSING AND PROPERTY INDEX	
M		1	
<p>*Electrocapillary Phenomena and the Writing Capacity of Metals. B. Kabayov and N. Ivanishenko (<i>Izv. Akad. Nauk S.S.S.R. (Bull. Acad. Sci. U.S.S.R.)</i>, 1966, (Chem.), (8), 765-771; <i>O. Ab.</i>, 1967, 81, 8241).—[In Russian, with English summary.] See also <i>Md. Ab.</i>, 1967, 4, 373. Surface-active substances such as phenol, p-cresol, p-toluidine, and thiourea increase the wettability of clean mercury. Interfacial tensions are calculated between bubbles and mercury by electrocapillary curves and surface-tension methods. Film thickening and adsorption of the surface-active substance at the boundary are postulated, which decrease with increase of potential difference. The presence of a film of electrolyte underneath the bubble is advanced to explain the change of bubble area with hydrogen polarization, and the film thickness is thus calculated. At the maximum of the electrocapillary curve this thickness is of the order of 2-5 mμ, starts to increase at 1-2 v., and reaches 60 mμ at 1-7 v.—S. G.</p>			
<p>ASB-51.1 METALLURGICAL LITERATURE CLASSIFICATION</p>			
<p>SEARCHED INDEXED</p>		<p>RELATIONS</p>	
<p>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100</p>		<p>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100</p>	

1ST AND 2ND COLUMNS										PROCESSING AND PROPERTIES INDEX										3RD AND 4TH COLUMNS									
BC										<p>Hydrogen overvoltage at high current densities. B. KARANDY (J. Phys. Chem. Russ., 1930, 8, 480-491).—Overvoltage of H has been measured at Pt, Ag, and Ag amalgam cathodes in 5N solutions of HCl and H<sub>2</sub>SO<sub>4</sub> up to c.d. 100 amp. per sq. cm. At 1.5 volts, the overvoltage is still a linear function of c.d.</p> <p>E. R.</p>										a-1									
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\*Formation of Pits in Electrodeposition. B. Kabanov and E. Painglus (Zhurnal Fizicheskoy Khimii [J. Phys. Chem.], 1936, 8, (6), 795-799).—[In Russian.] A study was made of zinc deposits obtained under various conditions. The change in pitting in an acid electrolyte on increase in current density, and its absence in presence of cyanides, is due to a change in the angle of contact of the gas bubbles, and not to a change in the amount of hydrogen evolved. Pit formation can be prevented by the addition of surface-active substances (e.g. amyl alcohol or *p*-cresol) which decrease the angle of contact of the gas bubbles. The observed results can be explained by the capillary theory of the wetting of metals.—N. A.

ASH-SLA METALLURGICAL LITERATURE CLASSIFICATION

FROM SYNDICATE

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2

PROCESSES AND PROPERTIES INDEX

Electrocapillary phenomena and the wetting of metals  
 III. Influence of surface-active substances on wetting  
 Properties of multimolecular layers... H. Kalamaz and N.  
 Ivanishchenko. *Acta Physicochim. U. R. S. S. S.* No. 5,  
 701-18 (1957) (in English); cf. C. A. 28, 4366; 31, 5041.  
 - Further study of the effect of surface-active substances  
 (PhOH, AnOH, C<sub>6</sub>H<sub>5</sub>OH, p-MeC<sub>6</sub>H<sub>4</sub>OH, (NH<sub>4</sub>)<sub>2</sub>CS and  
 p-MeC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>) on the contact angle of the interface be-  
 tween Hg and H-bubbles confirms the increase in wet-  
 tability of the Hg surface, as previously reported. Elec-  
 trocapillary curves and the surface tension at the boundary  
 of a soln. of Na<sub>2</sub>SO<sub>4</sub> and the above substances were stud.  
 From these were calcd. the interfacial tensions of the Hg-H  
 boundary for different values of the potential of the Hg.  
 The shape of the tension-potential curve is explained by  
 assuming that there is an increase in the adsorption of the  
 electrolyte up to -1.7 v., and a decrease beyond that  
 point, causing the thickness of the electrolyte layer to  
 pass through a max., which is estd. to represent a thickness  
 of hundreds of H<sub>2</sub>O mole.

J. H. Reedy

ASH-SLA METALLURGICAL LITERATURE CLASSIFICATION



*C<sub>F</sub>*

*2*

Thermodynamics of the lead accumulator. B. Kahn-  
nov. J. Phys. Chem. (U. S. S. R.) 11, 155-7(1938).—  
The theory of Harned and Hamer (C. A. 29, 3066) is  
supported by the actual behavior of the cell.  
B. C. P. A.

BC

Measurement of current density. **I. N. KAR-**  
**NOV** (J. Appl. Chem. Russ., 1938, 11, 1424-1426)  
A method is described. R. T.

AS 3.1.4 METALLURGICAL LITERATURE CLASSIFICATION

BC

A-1

Overvoltage on mercury in the presence of surface-active electrolytes. S. JOVA, B. KARANCY, E. KUTACINSKI, and F. CHRISTAKOV (*Acta Physicochim. U.R.S.S.*, 1939, 10, 317-332).—Two methods of measuring the overvoltage on a Hg cathode are described, (a) the method of the Hg drop, (b) the method of the large Hg cathode. Using acidified solutions of  $\text{Na}_2\text{SO}_4$ , KCl, KBr, KI, and  $(\text{NBu}_4)_2\text{SO}_4$ , the H overvoltage on Hg and the electro-capillary curves have been investigated. The H overvoltages are decreased by surface-active anions and increased by surface-active cations, in qual. agreement with the theory advanced by Frumkin (A., 1938, I, 201).

W. R. A.

<p>SC</p> <p>Hydrogen overvoltage on lead and capacity of the lead electrode. H. KARANOV and S. JORA (Acta Physicochim. U.R.S.S., 1939, 10, 817-830).—The H overvoltage on a clean Pb surface is &gt; that on all other metals including Hg, and the slope of the curve has the normal val. Abnormalities found by earlier workers were due to a contaminated surface. The overvoltage is almost independent of <math>(H_2SO_4)</math>. The true surface was determined by measuring the capacity of the double layer. At potentials more positive (against H) than <math>-0.6</math> v. the capacity increases markedly owing to adsorption of <math>SO_4^{2-}</math> ions.</p> <p>F. J. G.</p> <p>Karpor Inst. Physical Chem</p>		<p>AP-1</p>
<p>ASB-LLA METALLURGICAL LITERATURE CLASSIFICATION</p>		<p>82-11117</p>
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BC

2-1

Overvoltage of hydrogen on lead. B. KARANOV, S. KULIROV, L. VAMJUKOVA, Z. IOVA, and A. PROKOPIEVA (J. Phys. Chem. Russ., 1939, 13, 341—349).—The overvoltage,  $\eta$ , on bright very pure Pb in 0.01–8N  $H_2SO_4$  is  $>$  on all metals so far examined and does not vary with  $[H_2SO_4]$ ; the literature value for  $\eta$  seem all to be incorrect, apparently owing to roughness of the electrode and to impurities. Adsorbed  $PbSO_4$  on the electrode appears to promote the evolution of  $H_2$ , thus changing the slope of the  $\eta$ -c.d. curve (cf. A., 1933, 29); the process  $2H^+ + 2e^- + 0.5O_2 = H_2O$  has no such effect. R. C.

V-1613, 3 June 52  
Phys.-Chem. Inst. im. Karpov-

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

FROM	TO	CLASSIFICATION	REMARKS
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MA

**The Lead Electrode. II.—The Capacity of the Double Layer and the Measurement of the True Surface.** B. Kabanov and R. Yudkevich (*Zhur. Fizich. Khimii* [*J. Phys. Chem.*], 1950, 24, 317-317; *Chem. Zvest.*, 1940, 111, (11), 18).—[In Russian.] A simple method is described for determining the true surface of lead electrodes by measuring the capacity of the double layer of the metal by means of d.c. A relationship is shown to exist between the capacity of the lead electrodes and their potential. The absolute value of the capacity of a smooth lead electrode, in the region of minimum capacity, was found to be  $18 \mu\text{F./cm.}^2$ , i.e. of the same order of magnitude as in the case of mercury. It may be assumed that every negatively-charged pure metallic surface has a capacity of the same order of magnitude, which is independent of the nature of the metal. The presence of surface-active organic substances effects a decrease in the capacity of the double layer of the lead electrode surface, similar to the decrease in the case of mercury. Thus, the capacity of a spongy lead electrode in a 0.005-mol.  $\beta$ -naphthoquinone solution is only  $330 \mu\text{F./cm.}^2$ , as against  $750 \mu\text{F./cm.}^2$  in pure  $\text{H}_2\text{SO}_4$  solution.

1913

01

PROCESSES AND PROPERTIES INDEX

Overvoltage of mercury in the presence of surface-active electrolytes. Z. A. Iuda, B. Kalanov, & Kiminski and P. Chistyakov. *J. Phys. Chem.* (U. S. S. R.) 13, 1105-10 (1949). --See C. A. 43, 61101. P. H. R.

MGU and Inst. Phys. Chem. in Karpov-U-1614, 3 Jan 52

ASR-51A METALLURGICAL LITERATURE CLASSIFICATION

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Appearance and end of the motion of electrolyte in a dropping mercury cathode. A. Koryunov and N. N. Kabanov. *J. Phys. Chem.* (U.S.S.R.) 13, 1154 (1930).—K. describes a method for observing the motion of an electrolyte in a drop electrode by means of suspended charcoal particles. From exptl. data K. and K. find that as a result of unequal polarization of the drop when a p.d. exists in the soln., an upward or downward motion takes place at potentials corresponding, resp., to the cathodic and anodic branches, and ceases when the max. potential of the electrocapillary curve is reached. Upward motion ceases at  $-2.1-2.2$  v, and is accompanied by  $H_2$  evolution. For large potential drops, upward motion also occurs in the anode branch. Motion may also cease owing to the formation of hydrated oxide gels of metals as in the case of  $Fe^{III}$ ,  $Pb^{II}$ ,  $Cd^{II}$ ,  $Cu^{II}$ ,  $Ni^{II}$ ,  $Co^{II}$ ,  $Mn^{II}$ ,  $Al$ ,  $La$ ,  $Ce$ , etc., either at the limit of (depolarization) potential of  $O_2$  or on evolution of  $H_2$ . In cases in which motion does not cease, a max. current is observed.  
F. H. Rathmann

U-1615, 3 Jan 52

Inst. for Fertilizers and Insecto Pesticides, Lab. Production Control.





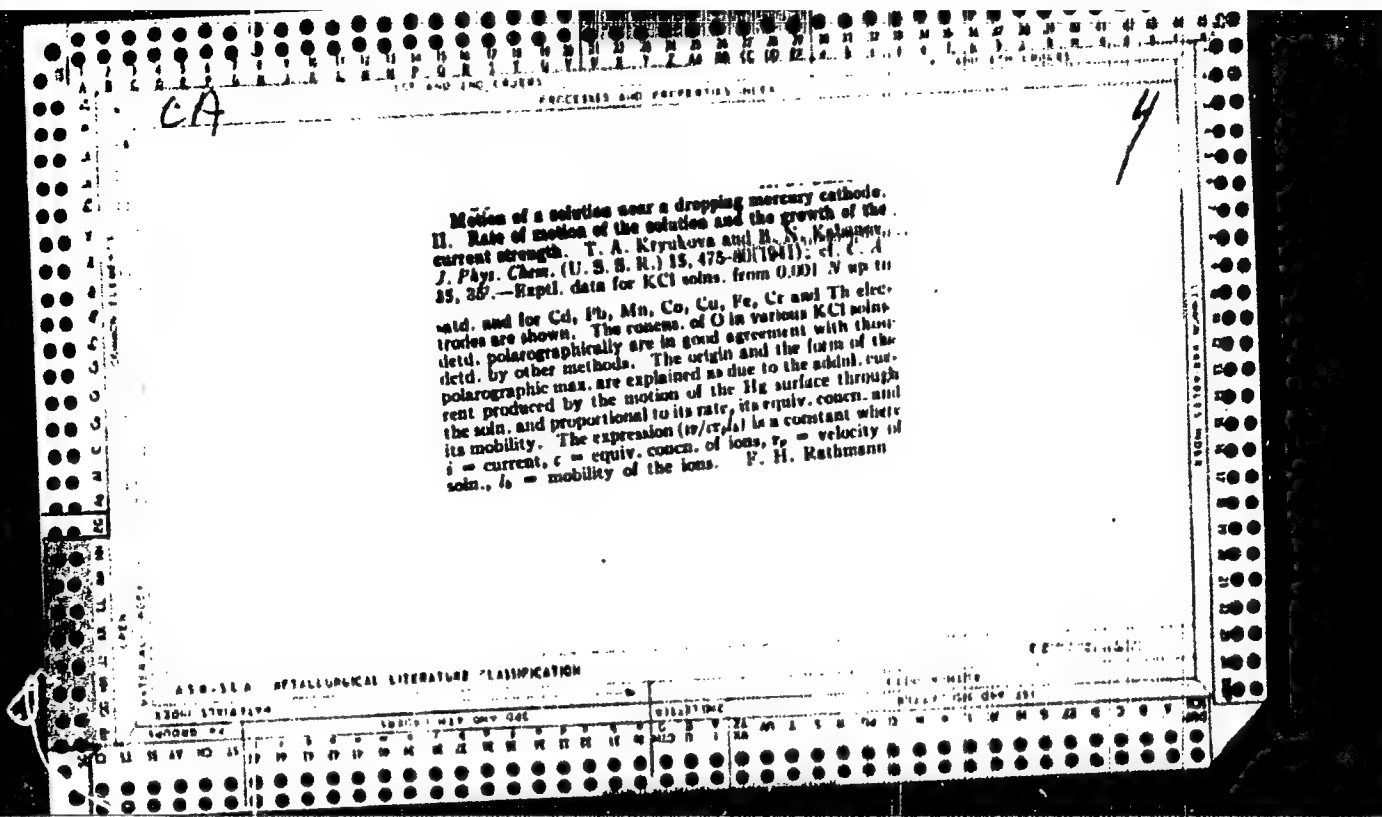
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17

\*Overvoltage of Hydrogen on Lead in the Presence of Surface-Active Organic Compounds. L. Vanyukova and B. Kabanov (Zhur. Fizich. Khimii (J. Phys. Chem.), 1960, 34, 1620-1623; Brit. Chem. Abs., 1962, [A 1], 191).— [In Russian.] The hydrogen overvoltage on spongy lead in 2-N-H<sub>2</sub>SO<sub>4</sub> is raised by organic additions. The increase is independent of the c.d. Substituted NH<sub>4</sub> compounds cause the highest increase, e.g. iso-C<sub>4</sub>H<sub>9</sub>, 0.46 v. in 0.002M solution, Bu 0.20 v. in 0.001M, Et 0.15 v. in 0.01M solution. Sulphates of (NMe<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>, NtMe<sub>2</sub>, benzopyridine, 3-naphthylquinoline, and acridine cause an increase of 0.01-0.35 v. Hexoic acid, C<sub>11</sub>H<sub>13</sub>OH, and other aliphatic substances are less active. No definite mechanism of the effect is suggested.

Lab. Surface Phenomena, Phys. Chem. Inst. in. Karpov -

Investigating the corrosion of lead in an etching medium. I. H. V. Krivolapova and B. N. Kabanov. *J. Applied Chem.* (U. S. S. R.) 14, 325-41 (in German, 1941); (1941); cf. C. A. 35, 1017P. A cast disk of Pb was scraped immediately before the expt. with a sharp chisel, so as to clean the entire surface. A 6.7 N soln.  $\text{H}_2\text{SO}_4$  was used as electrolyte. An electrode of pure Pb was placed on either side of the sample under test, at a distance of about 2.5 cm. The potential was measured against an auxiliary electrode  $\text{Hg}(\text{Hg}_2\text{SO}_4, \text{H}_2\text{SO}_4, 6.7 \text{ N})$ , at room temp. Polarization curves for the oxidation of electrodes of pure Pb and of Pb contg. 8% Sb, polarization reduction curves for electrodes of pure Pb in  $\text{N Na}_2\text{SO}_4$ , and of Pb electrodes with admixt. of Sb in  $\text{N Na}_2\text{SO}_4$ , pre-oxidized at a c. d. of 0.2 milliamperes/sq. cm. are plotted. Polarization curves were also prepd. of the reduction of electrodes from pure Pb and of Pb with an admixt. of Sb in 6.7 N  $\text{H}_2\text{SO}_4$ , oxidized at a c. d. of 10.0 milliamperes/sq. cm. The effect on the polarization curves of the following substances added to the electrolyte during the reduction of the electrodes of pure Pb oxidized in the presence of these substances was investigated: stearic acid,  $\text{HCl}$ ,  $\text{AcOH}$ , caprylic acid,  $\text{K}_2\text{CrO}_4$ ,  $\text{H}_2\text{SO}_4$ , palmitic acid,  $\text{HNO}_3$ , and  $\text{CoSO}_4$ . Addn. of  $\text{HCl}$ ,  $\text{AcOH}$ , palmitic, caprylic or stearic acids promotes the corrosion of Pb, while Co inhibits it. 10 references. A. A. Bochtling



4. 16.

At 11:30 AM

Part played by overvoltage and ohmic resistance in the passivity of lead. B. N. Kabanov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 21, 339-343).—The resistance of a Pb electrode rendered passive by a film of  $PbSO_4$  was determined, taking into account the phase displacement of the a.c. used. The ohmic component decreases with frequency and amounts to only 19 ohms in a fully passive electrode. The ohmic resistance plays no part in the potential change on passivation. This change of potential is connected with the c.d. in the pores of the layer. A. I. M.

MA 7

\*Crystallization of Lead Sulphate and the Thickness of the Passive Layer on Lead. B. N. Kabanov, (Compt. rend. (Doklady) Acad. Sci. U.R.S.S., 1941, 31, 641-644; C. Ab., 1943, 37, 667).—[In German.] The thickness of a passive layer on a previously reduced lead electrode and its dependence upon the c.d., temperature, concentration of  $H_2SO_4$ , and the presence of organic compounds, was investigated. The thickness of the passive layer increases with decreasing c.d. The relation between the two is given by the Peukert formula:  $I^a \tau = \text{constant}$ , where  $I$  is the c.d.,  $\tau$  the duration of passivation, and  $a$  a constant, which for smooth lead is 1.1–1.5, increasing with the concentration of the solution. The thickness of the layer in 40% ethyl alcohol is 4–6 times less than in an aqueous solution of the same acid concentration. The presence of methyl violet (0.01%) causes a deposit 2–3 times thicker than that produced without it. An increase in temperature also causes a thicker passive film.

1943

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1ST AND 2ND CATEGORIES		PROCESSING AND PROPERTIES INDEX	
<p>Motion of solution near the dropping mercury cathode.</p> <p>III. Motion in concentrated solutions of foreign salts and formation of false waves on the polarographic curve.</p> <p>T. A. Kryukova and B. M. Kabanov (Moscow Inst. of Fertilizers and Insecticides). <i>J. Gen. Chem. (U.S.S.R.)</i> 15, 294-302 (1945) (English summary); cf. <i>C.I.</i> 30, 6480.</p> <p>No. 45 A study was made of the rate of motion of soln. near the Hg drop as dependent on potential, dropping rate of Hg and the capillary dimensions. It was shown that in the presence of concd. foreign salts the motion of soln. near the dropping electrode is primarily affected by the motion of Hg in the drop caused by the effluence from the capillary. This motion produces a considerable increase of the final current which can attain 5 times the magnitude of that obtained in a soln. kept quiescent. The rate of this motion varies with the potentials applied; hence it causes a false wave in the polarographic curve. The effect can be lessened by proper selection of capillary dimensions and the rate of Hg outflow. Orifice shapes as very long cones appear to have the best characteristics.</p> <p>(1) M. Koudapill</p>			
<p>ASAC-11A METALLURGICAL LITERATURE CLASSIFICATION</p>			
<p>FROM 1170310</p>		<p>TO 1170310</p>	
<p>GROUP 1170310</p>		<p>GROUP 1170310</p>	



TEST AND, by (INDICATE)		PROCESSING AND PROPERTIES INDEX	
ca			9
<p>Passivation of iron in oxidizing solutions. N. N. Eshamov and O. Deryugina. <i>J. Applied Chem. (U.S.S.R.)</i> 18, 463-63 (1945) (English summary). - Improved procedure for Fe passivation resulted in the following recommendation: 1st bath: 0% <math>K_2Cr_2O_7</math>, 2% <math>KNO_3</math>, 2% <math>H_2SO_4</math>, 10 min. at 20° and 2nd bath: 0% <math>K_2Cr_2O_7</math>, 30 min. at 60°. The process is particularly useful for treatment of iron and steel details for temporary protection in storage. An additional lacquer coating of 2-5 microns serves to give sufficient protection against rust on 24-hr. immersion in water.</p> <p>G. M. Kosolapoff</p>			
<p>ASA 51A - BIBLIOGRAPHICAL LITERATURE CLASSIFICATION</p>			

4

The active smooth iron electrode. R. Kabanov and D. Lelko (Inst. Phys. Chem., Acad. Sci. U.S.S.R., Moscow). *J. Phys. Chem. (U.S.S.R.)* 20, 1005 (1946) (in Russian). The rapid depolarization that distorts measurements of smooth Fe electrodes is avoided if the vol. of the soln. around the electrode is very small (e.g., 0.02 cc. for an electrode surface of 3.5 sq. cm.). If such an electrode, after being heat-treated in  $H_2$  at 700°-800°, is immediately immersed in 2 N NaOH and anodically polarized with the current kept const., its potential shows two breaks; e.g., for cal.  $2.4 \times 10^{-6}$  amp./sq. cm. these breaks are at +0.04 and +0.28 v. (referred to H electrode) in 2 N NaOH. Extrapolation to zero cal. yields the potentials -0.015 and +0.13 v. These presumably correspond to  $Fe(OH)_2$  and to  $Fe(OH)_3$  (or  $Fe_2O_3$ ) electrodes. The amt. of electricity consumed by an electrode along a break (i.e., the electrode capacity) is, e.g., 0.15 (0.2) coulomb per sq. cm. of the visible surface area. Fe electrodes which had contact with air before being placed in 2 N NaOH show no breaks. Their potential is increased from 0 to 0.5 v. by as little as 0.001 coulomb/sq. cm. Presumably, this passivity of air-oxidized Fe is of the same type as the passivity of Pt.

J. J. Bherman

ASTM S1.4 METALLURGICAL LITERATURE CLASSIFICATION

KABANOV, B.

272

USSR/Electricity  
Electrodes  
Iron

Sep/Oct 1946

"The Active Iron Electrode in Alkaline Solutions," B. Kabanov, D. Leikis, Inst Phys Chem, Acad Sci USSR, Moscow, 16 pp

"Acta Physicochimica URSS" Vol XII, No 5

Experiments on electrochemical behavior of an iron electrode performed in an apparatus which permitted transferring the electrode, after heating to a high temperature in hydrogen atmosphere without contact with air, into polarization vessel. Polarization measurements were carried out over a range of current

58742

USSR/Electricity (Contd)

Sep/Oct 1946

densities from  $10^{-8}$  to  $10^{-3}$  A/cm in absence of foreign depolarizing agents. Discusses stoichiometry and mechanism of electrode processes on active iron. Received, 20 Jan 1946.

58742

KABANOV, B.

Kinetics of electrode processes on the iron electrode.  
B. Kabanov, R. Burstein, and A. Frankin (Acad. of Sci.,  
U.S.S.R.). *Discussions Faraday Soc.* No. 1, 230 (1967).  
It is shown that upon anodic polarization in alk.  
sols. at room temp., a smooth Fe electrode from the sur-  
face of which O was removed, is converted into  $Fe(OH)_2$   
which is afterwards oxidized to trivalent Fe. The elec-  
trochem. transition of Fe to  $Fe(OH)_2$  proceeds with a low  
overvoltage, but after some time the process ceases owing to  
the formation of passivating surface oxides. The greater  
the concn. of OH ions the greater is the quantity of Fe  
participating in the reaction. The Fe is not converted to  
 $Fe(OH)_2$  at room temp. if, prior to anodic polarization, an  
amt. of O corresponding to  $2.5 \times 10^{-4}$  coulombs/sq. cm.  
of true surface is deposited from the gas phase. If the  
anodic polarization is carried out at  $-15^\circ$ , the necessary  
quantity of O corresponds to  $1.1 \times 10^{-4}$  coulombs/sq. cm.  
Upon anodic polarization in dil. alkali passivation sets in  
when the amt. deposited is only  $2 \times 10^{-4}$  coulombs/sq. cm.  
of true surface. A mechanism is proposed to explain the  
relation between the formation of  $Fe(OH)_2$  and the passi-  
vation of Fe upon anodic oxidation. The mechanism of  
the anodic soln. of Fe in the presence of both Cl and OH  
ions in the soln. is also discussed.  
M. P. Quacy

CA

4

Solution and passivation of iron in alkaline solutions  
 B. Kabanov and D. Leikin. *Doklady Akad. Nauk SSSR*  
 98, 1085 (1917); *Chem. Zentr.* 1918, 28, cl 41 41.  
 6822g — A study was made of the influence of various  
 factors on the overvoltage and the yield of the process  $Fe \rightarrow$   
 $Fe(OH)_2$  taking place on a smooth, active, spectrally pure  
 Fe electrode. However, the increase in yield with increase  
 in alkali concn. was linear. The overvoltage of the electro-  
 chem. process was independent of the alkali concn. The  
 yield fell with increase in the c.d., while the overvoltage  
 increased linearly with the log of the c.d. The process of  
 anodic soln. and passivation of Fe in alk. soln. consists in  
 the transition of the Fe into  $HFeO_2^-$  and subsequent ppn  
 of  $Fe(OH)_2$  in the form of a porous deposit. With increas-  
 ing potential, passivation is accelerated to a greater degree  
 than soln. M. G. Mour

The magnitude of the limiting current on a rotating electrode. Yu. O. Siver and N. N. Kabanov (Inst. Phys. Chem., Acad. Sci. U.S.S.R., Moscow). *J. Phys. Chem. (U.S.S.R.)* 23, 52-7 (1949) (in Russian). -- (Pitts) Levich's theory (C.A. 50, 3194) (the thickness of the diffusion layer, which sets the rate of reaction at a rotating disk electrode, is  $1.62 D^{1/2} \omega^{1/2} \nu^{-1/4}$ ,  $D$  being the diffusion coeff.,  $\nu$  the kinematic viscosity, and  $\omega = 2\pi m$ ,  $m$  being the no. of revolutions per sec. This equation is confirmed by measuring the voltage-current curves for the reduction of  $O_2$  to  $H_2O_2$  in 0.05 N H<sub>2</sub>SO<sub>4</sub> at an amalgamated Cu cathode. The limiting current is proportional to  $\omega^{1/2}$  between  $m = 0.5$  and 40. Similar results are obtained at a fresh Ag electrode. After a prolonged cathodic polarization of a Ag disk,  $O_2$  is reduced to  $H_2O$  as well as to  $H_2O_2$ . J. J. Bierman

J. J. Lukersmith

ABSTRACTS OF THE LITERATURE CLASSIFICATION

CIA-RDP86-00513R000619720020-4"

4

Passivation of iron and cathodic reduction of ferrous hydroxide. S. A. Rosentavrig and B. N. Kabanov. *Zhur. Fiz. Khim.* (J. Phys. Chem.) 22, 1214-16 (1948). -- An Fe powder electrode (cf. C.A. 42, 7170d) was anodically oxidized with  $10^{-4}$  amp./sq. cm. in 5 N NaOH until its potential (referred to H electrode in 5 N NaOH) was 0.1 v., i.e. until completion of the reaction  $Fe \rightarrow Fe(OH)_2$ . The coulombs required for this were  $x_1$ . Then the electrode was cathodically reduced with  $10^{-4}$  amp./sq. cm. until its potential became const. The coulombs required for this were  $y$  but, of this amt. of electricity,  $z$  coulombs were used in evolving  $H_2$  which was measured. The ratio  $(y-z)/x$  was 40 in the beginning of reduction but dropped to 0.04 when  $y-z = 0.66 x_1$ . Thus, a complete reduction of  $Fe(OH)_2$  was impossible. When the partially reduced electrode was anodically oxidized again, the second  $x$  was only about 0.04  $x_1$ , and a similar reduction of  $x$  occurred in every subsequent reduction-oxidation cycle. A passivating film forms during the first anodic polarization and hinders further oxidation of Fe. The potential of Fe during reduction is detd. by the chem. compn. of the electrode and the e.d. of the two processes (i.e. reduction and evolution of  $H_2$ ).

J. J. Bikerman

Inst. Phys. Chem., A S U S S R, Moscow

Kabanov, B. N.

"Activation of Iron by Chlorine Ions in Anode Polarization,"

Dok. AN, 59, No. 5, 1948.

"Over-Voltage of Hydrogen in Powdered Iron Electrodes," Zhur. Fiz. Khim., 22, No. 4, 1948.



17-01:5511

1110-111 1111-1111-1111-1111

101 APR 1968		101 APR 1968	
PROCESSING AND PROPERTY FORM			
<p>CA</p> <p>Limiting current, concentration polarization, and diffusion coefficients. Yu. G. River and B. N. Kalinoy. <i>Zhur. Fiz. Khim.</i> 33, 426-36 (1959); cf. C.A. 43, 5351a. Curves of <math>i</math>, <math>i_0</math> against voltage, <math>\phi</math>, were detd. for a rotating amalgamated Cu cathode in 0.01 M HCl, 0.1 M KCl (I), 0.001 M H<sub>2</sub>SO<sub>4</sub> + 0.05 M K<sub>2</sub>SO<sub>4</sub> (II), and 0.001 M H<sub>2</sub>SO<sub>4</sub> + 0.25 M Na<sub>2</sub>SO<sub>4</sub> (III). In all instances the limiting <math>i</math> for H<sup>+</sup> discharge was proportional to <math>m^{1/2}</math> (<math>m</math> = no. of revolutions per sec., between 1.5 and 12). In sols. I, both the limiting <math>i</math> for H<sup>+</sup> discharge and <math>i_0</math> for hydrogenation of O<sub>2</sub> to H<sub>2</sub>O were found and the equation of Levich (C.A. 30, 3191<sup>1</sup>) <math>i_0/i_0 = 3.8</math> (<math>D_1/D_2</math>)<sup>1/2</sup>, <math>D_1</math> and <math>D_2</math> being diffusion coeffs. of H<sup>+</sup> and O<sub>2</sub>, resp., confirmed. For the other sols. the unknown <math>D_1</math> was calcd. from Levich's theory; it was <math>4.2 \times 10^{-5}</math> and <math>2.8 \times 10^{-5}</math> cm.<sup>2</sup>/sec. for II and III, resp. This method of calcg. <math>D</math> is more convenient than by the equation of Ilkovic and yields <math>D</math> values within 3-4%. An equation is derived for <math>\phi = f(i)</math> which contains 2 empirical consts. and agrees with expt.; Coates (C.A. 40, 19<sup>1</sup>) used an equation contg. only 1 empirical const. and could not confirm it.</p> <p>J. J. Likerman</p>			
ADD-31A METALLURGICAL LITERATURE CLASSIFICATION			
100000 HLT GNY 401		100000 HLT GNY 401	
100000 HLT GNY 401		100000 HLT GNY 401	

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KABANOV, B.N.

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318 p.

(MLHA 6:7)  
(Electrochemistry)

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Electrochemistry

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KABANOV, B. N.

Chemical Abstracts  
Vol. 48 No. 5  
Mar. 10, 1954  
General and Physical Chemistry

*Chen*  
The rate of reactions occurring in potentiometric titration. I. Ya. Polyak and B. N. Kabanov. *Zhur. Anal. Khim.* 8, 235-238 (1953). The rate of the electrochem. reaction  $\text{Fe}(\text{CN})_6^{4-} \rightarrow \text{Fe}(\text{CN})_6^{3-}$  at a Pt electrode was studied as it is affected by the concn. of the salts themselves and by other electrolytes. Expts. were made at a polarizing current of  $10^{-4}$ - $10^{-2}$  amp./sq. cm. Following the immersion of the electrode in a soln. the equil. potential was noted, and then increasingly higher currents were passed. Curves were obtained for cathodic and anodic polarization. One series of curves was obtained for solns. contg.  $1 \times 10^{-4}$ - $1 \times 10^{-2} M$  ferricyanide and  $1 \times 10^{-4} M$  ferrocyanide. Another set of curves was obtained for  $2 \times 10^{-2}$  and  $2 \times 10^{-4} M$  ferricyanide and  $2 \times 10^{-4} M$  ferrocyanide. Curves were obtained in solns. 0.05-1M with respect to  $\text{H}_2\text{SO}_4$  in 1M  $\text{H}_2\text{SO}_4$ -0.2M K, in 0.2M K, and in solns. free of both  $\text{H}_2\text{SO}_4$  and K. Curves were also obtained for solns. 0.36 and 0.54M with respect to Al and for solns. contg. the same concns. of Al but in which the Al was fixed as oxalate. Calcs. based on these curves show that in the system  $\text{Fe}(\text{CN})_6^{4-} \rightarrow \text{Fe}(\text{CN})_6^{3-}$  the potential is established within seconds and that the slowness of potentiometric titration is attributable rather to the slowness of chem. reactions taking place in the body of the soln. The titration process was accelerated in the presence of H and K. Contrary to opinion found in the literature, Al salts do not affect the Pt electrode reducing its sensitivity. Al apparently reacts with  $\text{Fe}(\text{CN})_6^{4-}$ , forming sol. but nondissocg. complexes. Fixing Al as oxalate removed this difficulty. In strongly acid solns. the reaction taking place is  $2\text{H}^+ + \text{Fe}(\text{CN})_6^{4-} + e \rightarrow \text{H}_2\text{Fe}(\text{CN})_6^{3-}$  rather than  $\text{Fe}(\text{CN})_6^{4-} + e \rightarrow \text{Fe}(\text{CN})_6^{3-}$ . Consequently the electrode potential is given by  $e = \frac{RT}{F} \ln \frac{[\text{Fe}(\text{CN})_6^{3-}][\text{H}^+]^2}{[\text{H}_2\text{Fe}(\text{CN})_6^{3-}]}$ . M. Hosh

Kabanov, B. N.

USSR.

62.  
①  
Passivation and activation of magnesium in alkali (potassium hydroxide) solutions. E. V. Bredko and B. N. Kabanov. *Doklady Akad. Nauk S.S.S.R.* 60, 1003-04 (1953).—Electrode potential, polarization, and H<sub>2</sub>-evolution rates were investigated during dissolution of Mg (Mg 99.95, Mn 0.03, Fe 0.0075, and Al 0.004%) in 2N KOH. On a surface freshly abraded with a quartz edge, H<sub>2</sub> was evolved at more pos. potential than on an aged surface. The formation of a passivating oxide layer was accelerated by anodic polarization. The oxide film slowed down but did not stop the corrosion current. At -1.0 v. vs. H electrode, the corrosion current was 10<sup>-3</sup> amp./sq. cm. for a freshly abraded, film-free Mg surface, but 10<sup>-4</sup>–10<sup>-5</sup> for the aged surface. Anodic overvoltage was decreased greatly by high cathodic c.d., e.g. at 10 amp./sq. cm., the corrosion current increased to 0.7 amp./sq. cm. At high anodic polarization, the corrosion current was very low. The passive film, which caused the high anodic overvoltage at anodic polarization, had low ohmic resistance, below 2 ohm/sq. cm., so that at total anodic polarization of 3 v., the ohmic drop in the film was only 40 mv. Oscillographic study of the electrochemical behavior of Mg surface immediately after etching, without polarizing current, led to an estimate that the potential shift by 0.2 v. in the course of the first 0.1–0.2 sec. is caused by adsorption of less than one-atom-thick layer of O. From measurements of the electrode surface capacity by a phase-shift method, a thickness of 14 Å. was calculated for the film formed by anodic polarization. The loose porous oxide layer formed on Mg had no passivating effect for and no significant ohmic resistance. Andrew Dinnicks

KABANOV, B. IV.

Subject : USSR/Chemistry AID P - 272  
Card : 1/1  
Authors : Kabanov, B. N. and P. D. Lukovtsev  
Title : Letter to the Editor  
Periodical : Usp. khim. 23, No. 3, 397-400, 1954  
Abstract : Critical review of a textbook of theoretical electro-chemistry: "Course in Theoretical Electrochemistry", by N. A. Izgaryshev and S. V. Gorbachev, 1951.  
Institution : None  
Submitted : No date

KABANOV, E. N.

USSR/Chemistry - Metallurgy

Card 1/1

Authors : Losev, V. V., and Kabanov, B. N.

Title : Electrochemical behavior of iron in hot concentrated alkali solutions.  
Part 1. -

Periodical : Zhur. Fiz. Khim., 28, Ed. 5, 824 - 836, May 1954

Abstract : The electrochemical behavior of iron was investigated in a solution of 10N NaOH at  $80 \pm 0.1^\circ$  by evaluating the polarization curves and the curves expressing the dependence of the electrode potential upon the amount of passed electricity. In addition, the authors measured the electrode capacitance in a variable current and the effect of the rate of agitation of the solution on the anode processes. The results are given in tables and graphs. Eighteen references: 12-USSR, 6-German.

Institution : Acad. of Sc. USSR, Institute of Physical Chemistry, Moscow

Submitted : Aug. 2, 1953

*Evaluation B-83976*

KABANOV, B. N.

USSR/Chemistry - Metallurgy

Card 1/1

Authors : Losev, V. V., and Kabanov, B. N.

Title : Electrochemical behavior of iron in hot concentrated alkali solutions.  
Part 2. -

Periodical : Zhur. Fiz. Khim., 28, Ed. 5, 914 - 925, May 1954

Abstract : Results obtained in the study of the passivating effect of iron ions on the electrode indicate the presence, on the surface of the iron electrode, of surface active oxygen compounds originating as result of electrochemical reaction of the iron with the hydroxyl ions. The properties of these surface compounds depend upon the electrode potential and iron-ion concentration in the solution. The third anode process, as described in this report, is accompanied by the formation of a ferric oxide layer and rapid increase in the electrode capacitance. Seven USSR references. Table, graphs.

Institution : Acad. of Sc. USSR, Institute of Physical Chemistry, Moscow

Submitted : Oct. 2, 1953



KABANOV, B. N.

USSR/ Chemistry Physical chemistry

Card : 1/1

Authors : Vanyukova, L. V., and Kabanov, B. N.

Title : Electrochemical investigation of passive iron

Periodical : Zhur. fiz. khim. 28, Ed. 6, 1025 - 1035, June 1954

Abstract : The nature of electrochemical processes, taking place on a passive iron electrode in alkali solutions during anode polarization, was investigated and the effect of Cl-ions on these processes is explained. It was found that the capacitance of the double Fe-electrode layer, oxidized by heating in the air, measured at 20000 per/sec, is approximately 4 times lower than the capacitance of a metal free of oxides. The inhibiting effect of Cl-ions on the rapid oxygen adsorption and desorption process is explained. Twenty-two references: 18 USSR, 3 German and 1 USA. Tables; graphs.

Institution : Acad. of Sc. USSR, Institute of Physical Chemistry, Moscow

Submitted : July 21, 1953

USSR/Physics - Chemistry

Card 1/1 : Pub, 147 - 24/27

Authors : Kabanov, B. N., and Temkin, M. I.

Title : The problem concerning the sign of the electrode potential and electromotive force

Periodical : Zhur. fiz. khim. 28/12, 2258-2261, Dec 1954

Abstract : Discussion was held on the disunity in Soviet and foreign literature regarding the adoption of a unified sign for the electrode potential and electromotive force. It is believed that a complete clarity in designations could be attained by adopting a terminology close to the one used in the I. E. Tamm course. Five references ; 2 USA and 3 USSR (1936-1954).

Institution : .....

Submitted : July 27, 1954

KABANOV, B. N.

USSR/Chemistry - Physical chemistry

Card 1/1 : Pub. 22 - 28/44

Authors : Kabanov, B. N.; Leykis, D. I.; and Krepakova, E. I.

Title : The mechanism of cathode passivation of a lead-dioxide electrode

Periodical : Dokl. AN SSSR 98/6, 989-992, October 21, 1954

Abstract : The process of  $PbO_2$  passivation in sulfuric acid was investigated by the method of plotting charge curves and simultaneous measurement of the size of the actual electrode surface free from the insulating  $PbSO_4$  layer. The degree of surface coating at which a sharp change in the electrode potential takes place, thus indicating the passivation of the electrode, was determined. The capacitance of the double-electrode layer was established by means of an impedance compensation circuit. Characteristic measurement results obtained during the discharge of a smooth lead dioxide electrode are shown in one of the graphs. Three USSR references (1940-1953). Graphs.

Institution : Academy of Sciences USSR, Institute of Physical Chemistry

Presented by: Academician A. N. Frumkin, May 31, 1954

USSR/ Chemistry - Physical chemistry

Card 1/1 Pub. 22 - 36/56

Authors : Katanov, B. M.; Kiseleva, I. G.; and Loykis, D. I.

Title : Determination of the zero charge potential on a  $PbO_2$  electrode.

Periodical : Dok. AN SSSR 99/5, 805-808, Dec 11, 1954

Abstract : Experiments were conducted to determine whether the method employed in measuring the capacity of a double layer would be suitable in determining the zero point of a  $PbO_2$  electrode. The knowledge of the zero point is essential for the explanation of the working mechanism of a lead-plate battery where  $PbO_2$  is the active material of the positive electrode. The three basic characteristics of a  $PbO_2$  electrode are listed. The extent to which a double layer of an oxide electrode, having metallic conductivity is analogous in its characteristics to layers of a metallic electrode, was investigated and the results are described. Eleven references: 10-USSR and 1-USA (1939-1954). Graphs.

Institution: Academy of Sciences USSR, Institute of Physical Chemistry

Presented by: Academician A. N. Frankin, July 8, 1954

KABANOV, B. N.

USSR/Scientists - Chemistry

Card 1/1 Pub. 147 - 1/21

Authors : Rebinder, P. A.; Dolin, P. I.; Kabanov, B. N.

Title : The work of A. N. Frumkin and his school in the field of surface phenomena and kinetics of electron processes

Periodical : Zhur. fiz. khim. 29/10, 1746-1750, Oct 1955

Abstract : Honoring the 60-th birthday of the famous Soviet physico-chemist, Academician Aleksandr Naumovich Frumkin, a group of his colleagues published a list of Frumkin's scientific research work on surface phenomena and the kinetics of electrode processes.

Institution : .....

Submitted : .....

USSR/Electrochemistry

B-12

Abs Jour : Ref Zhur - Khimiya, No 8, 1957, 26311

Author : G.P. Loshchinina, B.N. Kabanov, A.M. Murtazayev.  
Inst : Academy of Sciences of Uzbek SSR.  
Title : Cathode Behavior of Electroplating Alloy Ni-Co in Alkali Solutions at High Current Densities.

Orig Pub : Dokl. AN UzSSR, 1956, No 8, 17-22.

Abstract : The cathode behavior of the electroplating alloy of Ni and Co containing 11.8% of Co was studied in 3 n. KOH at  $i$  from  $1 \times 10^{-4}$  to 0.3 a per sq. cm by the method of taking the curves of the H overvoltage ( $\eta$ ) and by measuring the capacity ( $C$ ) of the double electrical layer by an alternating current ( $10^4$  cycles). It is shown that the slope factor ( $b$ ) of curves ( $\eta$ ,  $\log i$ ) equals from 0.115 to 0.14 v in a hydrogen atmosphere, as well as in an oxygen atmosphere at a low  $i$ , and that  $C$  diminishes with time,  $b$  increases up to 0.250 v. The authors suppose that the slow adsorption of hydrogen is the cause of the slow increase of  $\eta$  accompanied by an insignificant alteration of  $C$ .

Card : 1/1

LEYKIS, D.I.; KABANOV, B.N.

Nonpolarizing electrodes for measuring small variations of  
potentials in the ocean. Trudy Inst.ocean. 19:112-116 '56.  
(MLRA 10:2)

(Ocean) (Electric measurements)

*F. A. Babayev, B. N.*  
USSR/Electrochemistry

B-12

Abstr Jour : Ref Zhur - Khimiya, No 8, 1957, 26302

Author : I.G. Kiseleva, B.N. Kabanov

Inst : Academy of Sciences of USSR

Title : Adsorption of Sulfuric Acid on Lead Dioxide Electrode

Orig Pub : Dokl. AN SSSR, 1956, 108, No 5, 864-867

Abstract : The influence of the potential  $\varphi$  in the range from 1.6 to 2.1 v (1. v. e.) on the adsorption magnitude (A) of  $H_2SO_4$  on  $PbO_2$  from 0.005, 0.01, 0.05 and 0.5M solutions of  $H_2SO_4$ , the influence of an addition of  $CoSO_4$  on the adsorption of  $H_2SO_4$  and A of  $CoSO_4$  on  $PbO_2$  were studied. A was determined by radiochemical measurements with the application of isotopes  $S^{35}$  and  $Co^{60}$  and titration with a colored indicator by the decrease of the adsorbed substance in the solution. Porous  $PbO_2$  electrodes (volume 3.4 cub. cm, actual surface  $1 \times 10^5$  sq. cm), as well as surface electrodes of  $PbO_2$  applied to Pb tapes (actual surface about  $10^4$  sq. cm) served as adsorbents. It was shown that at  $\varphi$  of 1.75 to 1.9 v, i.e. in the region of the potential of the zero charge (RZhKhim, 1955, 36973), A increases sharply with the increase of  $\varphi$ . At  $\varphi$  about 2 v, A

Card : 1/2



KABANOV, B. II.

Moscow

"Untersuchungen über die Passivierung von Metallen durch Kapazitätsmessungen bei höheren Frequenzen" a paper submitted at the International Symposium of Passivity of Metals, 2-7 Sep 57, Darmstadt, Germany.

C-3,800,126

LEYKIS, D.I.; KABANOV, B.N.

Measuring the capacitance of the electric double layer on solid  
electrodes. Trudy Inst. fiz. khim. no.6:5-11 '57. (MIRA 11:10)  
(Electrodes) (Electric capacitance)

ZHDANOV, E. I.

"The 4th All-Union Conference on Electrochemistry," by E. N. Kabanov,  
Zhurnal Fizicheskoy Khimii, Vol 31, No 2, Feb 57, pp 530-527

The 4th All-Union Conference on Electrochemistry, called by the Department of Chemical Sciences of the Academy of Sciences USSR and the Institute of Physical Chemistry, Academy of Sciences USSR, was held at Moscow on 1-6 October 1956. At 21 plenary and sectional meetings of this conference 138 papers dealing with the kinetics and mechanism of electrode processes were given. Scientists from the US, England, Poland, Germany, Czechoslovakia, Hungary, Bulgaria, and China participated in the conference.

S. I. Zhdanov and V. I. Zykov (Moscow) reported in a paper presented by them that the course of the reduction of nitrate ions at a dropping mercury cathode in the presence of  $\text{ThCl}_4$  can be explained with the aid of the theory of delayed discharge, if the formation of  $\text{OH}^-$  ions in the presence of thorium ions and the precipitation of thorium hydroxide as a result of the increase in the alkaline reaction are taken into consideration.

I. Koryta (Prague) described the results of his research on the separation of cadmium from cyanide complexes at dropping mercury and stream electrodes.

At the sectional meeting on chemical sources of current the result of work on the mechanism of processes taking place in cells and storage batteries were reported. Papers by I. I. Koval' and V. A. Barilenko (Moscow); Ya. B. Kasparov, E. G. Yampol'skaya, B. N. Kabanov, Ye. B. Krivolapova, E. S. Vaysverg, and B. N. Kabanov (Podol'sk) dealt with the mechanism of processes which take place at the electrodes of lead storage batteries during the operation of these batteries. The nature of the effects exerted by the addition of barium sulfate, cobalt sulfate, and surface-active agents on the activity of the lead and lead dioxide electrodes was investigated. Reports by S. A. Rozentsveyg and V. I. Levina (Leningrad) and S. F. Selitskaya and L. A. Leont'yeva (Podol'sk) dealt with the mechanism of the activity of iron electrodes in alkali storage batteries. Papers by T. A. Kryukova (Moscow) and V. N. Flerov (Gor'kiy)

were concerned with processes that take place in cells and storage batteries in which an alkaline zincate electrolyte is employed. Papers by N. A. Shurmovskaya and R. Kh. Burshteyn (Moscow) and by V. S. Daniel'-Bek et. al. (Leningrad) reported the results of research on processes which occur in iron-carbon cells and fuel elements. General problems of the mechanism of the generation of current were discussed in reports by P. D. Lukovtsev and D. I. Leykis (Moscow). N. A. Balasheva, V. A. Ivanov, and L. D. Shibayev (Moscow) reported on results obtained by applying tracer atoms in research on processes taking place in chemical sources of current (i.e., electric cells and storage batteries).

At the meeting of the section on electrode processes in melts theoretical problems which have a bearing on processes that are of practical importance and on the behavior of systems which are encountered in technological work were discussed. I. D. Panchenko (Kiev) and N. G. Chovnyk (Kuybyshev) reported on the application of polarographic methods in the investigation of melts. A paper by N. I. Tugarinov and N. D. Tomashov (Moscow) dealt with the corrosion of metals in melts.

Twelve reports were concerned with a problem which is of the greatest importance for the branch of chemistry which deals with electrolytic deposition, viz., the simultaneous discharge of ions. The problem of the production of ultra-pure metals, which was discussed by A. Ye. Porkhunov (Ust'-Kamenogorsk) and V. V. Baboshkin (Orsk), is closely connected with that of the simultaneous discharge of ions.

A report by A. A. Rakov (Moscow) described a method by which anodic oxidation can be regulated in such a manner that one of the products of this oxidation, i.e., oxygen, persulfuric acid, or ozone, is formed to a predominant extent. Specifically, the current yield of ozone at a platinum anode can be brought to 30%. Great interest was elicited by a paper presented by O. V. Izbekova on behalf of a group of investigators belonging to the school of the late N. N. Voronin (Kiev). This report described a procedure for the electrolytic reduction of oxygen in alkaline solution. In this procedure  $H_2O_2$  is produced by expressing the depolarizer through pores of the electrode.

*SUM IN 1451*

AUTHOR:

Kabanov, B.N., Barelko, Ye.V.

76-11-19/35

TITLE:

Hydrogen Overvoltage on Magnesium (Perenapryazheniye vodoroda na magnii)

PERIODICAL:

Zhurnal Fizicheskoy Khimii, 1957, Vol. 31, Nr 11, pp. 2501-2506 (USSR)

ABSTRACT:

On the strength of the experiments carried out it is shown that the hydrogen overvoltage on a mechanically protected magnesium surface in KOH solutions, which, as to amount, is near the overvoltage on a pure magnesium surface, has a constant  $\alpha$  of the overvoltage equation, which is equal to  $1.4 \pm 0.1$  V. It is shown that the hydrogen overvoltage on a magnesium surface oxidized in the solution is higher by 0.5 V in the case of a current density of  $2 \cdot 10^{-2}$  A/cm<sup>2</sup> than in the case of a protected one. In the case of oxidized magnesium the curve has a considerable break. It is further shown that the chlorine ions in the case of a high concentration reduce the hydrogen overvoltage on magnesium in diluted alkaline solutions, which is explained by the displacement of part of the oxygen by chlorine ions from the magnesium surface by adsorption. There are 6 figures and 9 references, 8 of which are Slavic.

Card 1/2

Hydrogen Overvoltage on Magnesium

76-11-19/35

ASSOCIATION: AN USSR, Institute for Physical Chemistry, Moscow (Akademiya  
nauk SSSR. Institut fizicheskoy khimii, Moskva)

SUBMITTED: August 6, 1956

AVAILABLE: Library of Congress

Card 2/2



AUTHORS: Kabanov, B. N., Polyak, L. Ya. SOV/75-13-5-6/24

TITLE: Electrochemical Behavior of Aluminum Electrode in the Process of Titration of an Aluminum Ion With Fluoride  
(Elektrokhimicheskoye povedeniye alyuminiyevogo elektroda pri titrovanii iona alyuminiya ftoridom)

PERIODICAL: Zhurnal analiticheskoy khimii, 1958, Vol 13, Nr 5, pp 538-544 (USSR)

ABSTRACT: Since 1948 also pairs of aluminum nichrome electrodes have been used as electrodes in the titration of aluminum ions with a solution of sodium fluoride (Refs 2-4). In these practical applications one had neither clarified the way these pairs of electrodes operate, the cause of the displacement in potential at the end point of titration, nor the influence of the cations and anions in the solution on the electrochemical behavior of the electrodes. These questions are the subject of the treatise under review. It was discovered that the potential displacement at the end point of titration is caused by a distinct change of the stationary potential of the aluminum electrode (indicator electrode); the potential of the nichrome electrode does not change during titration. In order to clarify the character

Card 1/3

SOY/75-13-5-6/24

Electrochemical Behavior of Aluminum Electrode in the Process of Titration  
of an Aluminum Ion With Fluoride

of the anodic and cathodic processes which determine the stationary potential of the aluminum electrode and its change in titration, polarization curves of the aluminum electrode in solutions of fluoride ions and in the presence of the ions  $\text{Cl}^-$ ,  $\text{CH}_3\text{COO}^-$ , and  $\text{SO}_4^{2-}$  were established. These foreign ions were added in varying combinations and concentrations that correspond to the conditions in the titration of aluminum salts with fluorides. It turned out that the distinct potential displacement in the end point of titration in the direction of negative values is caused by the accelerated effect of the fluoride ions upon the anodic process of decomposing the aluminum (activation of the aluminum electrode). The fluoride ions have practically no influence upon the cathodic process (separation of hydrogen). Chlorine ions remove the entire passivation of aluminum by increasing the potential scope in which the fluoride ions are active. Acetate ions increase the sensitivity of the aluminum electrode toward fluoride ions. The cause for the potential displacement of the aluminum electrode

Card 2/3

SOV/75-13-5-6/24

Electrochemical Behavior of Aluminum Electrode in the Process of Titration  
of an Aluminum Ion With Fluoride

at the end point of titration under the influence of fluoride ions is the same both in compensating as well as in non-compensating methods of titration. The limits of applicability of the non-compensating methods were established. They depend on the field of current density in which the fluoride ions have their activating influence on the aluminum electrode. In an experimental part the tests which were carried out are described. There are 7 figures and 6 references, 5 of which are Soviet.

ASSOCIATION: All-Union Scientific Research Institute of Aviation Materials

SUBMITTED: August 31, 1956

Card 3/3

AUTHORS: Kabanov, B. N., Kokoulina, D. V.

SOV/20-120-3-34/67

TITLE: On the Mechanism of the Dissolution of Magnesium on the Anode  
(O mekhanizme anodnogo rastvoreniya magniya)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol. 120, Nr 3, pp.558-561  
(USSR)

ABSTRACT: The authors investigate the rules governing the oxidation of monovalent magnesium. If the velocity  $i_2$  of the process taking place on the anode  $Mg \rightarrow Mg^+$  is determined by the slowing down of the electron transition (on which occasion hydration increases), the formula

$$i_2 = k_2 [Mg^+]_s \exp \frac{\beta F \phi}{RT}$$

can be written down. The value  $\beta = 0,25$  is used. For the parallel process of diffusion transition of  $Mg^+$  from the electrode surface into the solution it holds that  $i_3 = FD \frac{dc}{dx} = FD [Mg^+]_{x=0} / \delta = k_3 [Mg^+]_s$ , where  $k_3$  depends on the velocity of mixing. The distribution of magnesium over the two processes  $Mg^+_{adsorbed} \rightarrow Mg^+ + 0$  and  $Mg^+_{adsorbed} \rightarrow Mg^+_{dissolved}$  does not depend on the concentration of the

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SOV/20-120-3-34/67

## On the Mechanism of the Dissolution of Magnesium on the Anode

monovalent magnesium on the surface, but only on the potential. On the other hand, the experiments carried out by the authors gave the following results: In the activated solutions: ( $\text{MgCl}_2$ ,  $\text{MgBr}_2$ ,  $\text{MgSO}_4$ ) the potential of the dissolution of magnesium on the anode hardly depends on the current density at all. With a decrease of current density on the anode the passivity of the magnesium increases. In the passivation of magnesium the velocity of the oxidation of the ions  $\text{Mg}^+$  on the anode in the case of a constant electrode potential depends only on the change of  $[\text{Mg}^+]$ . This is true also for the diffusion of these ions from the electrode. The theoretical dependence of the valence  $n_1$ , which was found here, on the electrode potential  $\varphi$  gives an S-shaped curve which, on the whole, corresponds to the experimental curve. Thus, the velocity of the second stage of the oxidation of magnesium on the anode is probably determined by the velocity of electron transition. There are 1 figure and 5 references, 3 of which are Soviet.

Card 2/3

On the Mechanism of the Dissolution of Magnesium on the Anode

80V/20-120-5-34/67

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR  
(Institute of Physical Chemistry, AS USSR)

PRESENTED: January 15, 1958, by A. N. Frumkin, Member, Academy of  
Sciences, USSR

SUBMITTED: January 13, 1958

1. Magnesium--Oxidation
2. Magnesium--Electron transitions
3. Anodes (Electrolytic cell)--Electrochemistry

Card 3/3

AUTHORS: Balashova, N. A., Kabanov, B. N. SOV/20-121-1-35/55

TITLE: The Electrochemical Behaviour of Zirconium in Sulfuric Acid ( Elektrokhimicheskoye povedeniye tsirkoniya v sernoy kislote)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol. 121, Nr 1, pp. 126 - 128 (USSR)

ABSTRACT: In the present paper a report is made on the investigation of the cathodic and anodic behaviour of zirconium and of the no-current time variation of its potential in 1N H<sub>2</sub>SO<sub>4</sub> at 25°. The experiments were performed in a hermetically sealed glass device at a rodlet of zirconium. According to the experimental results the oxide film which had formed on the surface of zirconium when kept in air for some time displaces the stationary potential towards the positive side. For cleaned electrodes the displacement towards the positive side amounts to 0,10 - 0,16 V. The laws found on occasion of cathodic and anodic polarisation of zirconium in 1N H<sub>2</sub>SO<sub>4</sub> speak for a great influence of the oxide films. The cathodic

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The Electrochemical Behaviour of Zirconium in  
Sulfuric Acid

SOV/20-121-1-35/55

curves show a break in the range of potentials from -0,6 to -0,2 V. On both sides of the break the curve of the excess-voltage of hydrogen satisfies the Tafel' equation. The zero point of zirconium according to the work function of the electron seems to be near -1 V. Beginning at very low current densities ( $1 - 2 \cdot 10^{-5}$  amperes/cm<sup>2</sup>) zirconium is very much passivated by an anodic polarisation. At a current density exceeding  $10^{-4}$  amperes/cm<sup>2</sup> a gold-colored film with an effective ohmic resistance of the order of some dozens of ohms is produced. In the case of an inverse course of the curve of anodic polarisation a strong hysteresis can be observed. The oxide film obtained on zirconium by anodic polarisation reduces the velocity of hydrogen separation on zirconium. There are 3 figures and 7 references, 4 of which are Soviet.

ASSOCIATION: Institut elektrokhemii Akademii nauk SSSR (Institute of  
Electrochemistry AS USSR)

Card 2/3



5(4)

SOV/20-122-6-24/49

AUTHORS: Kiseleva, I. G., Kabanov, B. N.

TITLE: On the Formation and on the Electrochemical Properties of Crystalline Modifications of Lead Dioxide (Ob obrazovanii i elektrokhimicheskikh svoystvakh kristallicheskikh modifikatsiy dnuokisi svintsa)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 122, Nr 6, pp 1042-1045 (USSR)

ABSTRACT:  $PbO_2$  exists in a tetragonal ( $\beta$ -form) and in a rhombic ( $\alpha$ -) modification. According to available experimental data, the conditions in favor of the  $\alpha$ - or  $\beta$ -form essentially depend upon whether  $PbO_2$  is formed in the presence or in the absence of  $H_2SO_4$ . It could therefore be assumed that formation of the various crystal forms is connected with the absorption of sulfuric acid, which is retained very firmly and in large quantities on  $PbO_2$ . For the purpose of verifying this assumption the authors carried out comparative measurements of the absorption capacity, and they also investigated the structure

Card 1/3

SOV/20-122-6-24/49

On the Formation and on the Electrochemical Properties of Crystalline Modifications of Lead Dioxide

of the electrodes produced under various conditions from  $\text{PbO}_2$ . Results are shown by a table. Adsorption was measured radiochemically, and the structure was investigated radiographically. The precipitates produced from a neutral solution or by the oxidation of  $\text{PbSO}_4$  in 0.01 N  $\text{H}_2\text{SO}_4$  essentially consisted of  $\alpha\text{-PbO}_2$ . In the case of an electrochemical recrystallization of the electrode in 8 N  $\text{H}_2\text{SO}_4$  an irreversible adsorption of  $\text{H}_2\text{SO}_4$  on  $\text{PbO}_2$  and a transformation of  $\alpha\text{-PbO}_2$  into  $\beta\text{-PbO}_2$  takes place. The desorption of  $\text{H}_2\text{SO}_4$  is accompanied by a transformation of  $\beta\text{-PbO}_2$  into  $\alpha\text{-PbO}_2$ . The authors then discuss the comparison drawn between the electrochemical behavior of  $\alpha\text{-PbO}_2$  and  $\beta\text{-PbO}_2$ . The curves plotted at the anodes for the dependence of  $\varphi$  on  $\lg i$  develop parallel to each other with a distance of 30 - 40 millivolts. The exchange current is nearly the same in both modifications. Various details are then discussed. According to the results obtained by the present paper, the delay of the process  $\text{PbO}_2 \rightarrow \text{PbSO}_4$  and the forming of the

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SOV/20-122-6-24/49

On the Formation and on the Electrochemical Properties of Crystalline Modifications of Lead Dioxide

$\beta$ -form are probably due to the chemical adsorption of sulfuric acid on the  $PbO_2$  surface. Continuation of the here discussed investigations would be of practical interest. There are 2 figures, 1 table, and 11 references, 5 of which are Soviet.

ASSOCIATION: Institut elektrokhimii Akademii nauk SSSR  
(Institute for Electrochemistry of the Academy of Sciences, USSR)

PRESENTED: June 10, 1958, by A. N. Frumkin, Academician

SUBMITTED: June 10, 1958

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SOV/20-123-5-32/50

5(4)

AUTHORS: Pleskov, Yu. V., Kabanov, B. N.

TITLE: The Oxidation of Bivalent Vanadium on a Germanium Anode  
(Okisleniye dvukhvalentnogo vanadiya na germaniyevom anode)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 123, Nr 5, pp 884-886  
(USSR)

ABSTRACT: The authors investigated the oxidation of ions of bivalent vanadium on a revolving disk electrode of single crystalline n-type germanium (specific resistance 1.8 Ohm.cm, diffusion length 0.3 mm). The solution of bivalent vanadium was prepared by the reduction of  $V_2O_5$  in a solution of  $H_2SO_4$  by amalgamated zinc. The rate of oxidation of germanium does not depend on the intensity of mixing the solution and beginning with a potential of 0.5 v it is limited by the rate of diffusion of the holes from the interior parts of the sample to its surface ("saturation current"). If bivalent vanadium is introduced into a solution in which germanium is dissolved at potentials more positive than 0.5 v, the current (which flows through the electrode at a constant potential) increases sharply. This increase  $\Delta I$  is proportional to the

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The Oxidation of Bivalent Vanadium on a Germanium Anode

concentration of  $V^{II}$  and to the square root of the angular velocity  $\omega$  of the electrode; it can be several times greater than the "current of saturation" of the dissolution of germanium. According to these results, the ions of  $V^{II}$  are oxidized on the germanium anode (germanium being dissolved simultaneously) in that region of potentials in which the dissolution rate of germanium has its maximum value. Under these experimental conditions, the rate of oxidation of  $V^{II}$  is markedly higher than the diffusion rate of the holes. Holes are therefore not necessary for the oxidation of  $V^{II}$  on a germanium anode. On a revolving disk electrode of platinum, the ions  $V^{II}$  are oxidized to  $V^{III}$ , the maximum current being proportional to the concentration of  $V^{II}$  and to the square root of the angular velocity  $\omega$  of the electrode. The rate of oxidation of bivalent vanadium on anodes of germanium and platinum depend on the rate of diffusion of  $V^{II}$  ions from the interior parts of the solution to the surface of the electrode. The semiconductor character of the

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The Oxidation of Bivalent Vanadium on a Germanium Anode

germanium anode thus does not influence the kinetics of the oxidation of bivalent vanadium. There are 1 figure, 1 table, and 7 references, 3 of which are Soviet.

ASSOCIATION: Institut elektrokhemii Akademii nauk SSSR  
(Institute of Electrochemistry of the Academy of Sciences,  
USSR)

PRESENTED: July 22, 1958, by A. N. Frumkin, Academician

SUBMITTED: July 21, 1958

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KABANOV B. N.  
BUKHMAN, S. P.

5(4) PHASE I BOOK EXPLOITATION SOV/2216

Soveshchaniye po elektrokhemii. 4th, Moscow, 1956.

Trudy...i [labornik] (Transactions of the Fourth Conference on Electrochemistry: Collection of Articles) Moscow: Izdat. Khim. 1957, 1959. 868 p. Errata slip inserted. 2,500 copies printed. Sponsoring Agency: Akademiya nauk SSSR. Otdeleniye khimicheskikh nauk.

Editorial Board: A. M. Frumkin (Resp. Ed.) Academician, O. A. Yasin, Professor, S. I. Zhdanov (Resp. Secretary), B. N. Kabanov, Professor, Ya. M. Kolotyrkin, Doctor of Chemical Sciences, V. V. Losev, P. D. Medvedev, Z. A. Solov'yeva, V. V. Stender, Professor, and O. M. Yudin (Ed.). Ed. of Publishing House: M. G. Fegorov; Tech. Ed.: T. A. Prusakova.

PURPOSE: This book is intended for chemical and electrical engineers, physicists, metallurgists and researchers interested in various aspects of electrochemistry.

COVERAGE: The book contains 127 of the 138 reports presented at the Fourth Conference on Electrochemistry, sponsored by the Department of Chemical Sciences and the Institute of Physical Chemistry, Academy of Sciences, USSR. The collection contains papers on different branches of electrochemical kinetics, double layer theories and galvanic processes in metal electrodeposition and industrial electrolysis. Abridged discussions are given at the end of each division. The majority of reports not included here have been published in periodical literature. No personalities are mentioned. References are given at the end of most of the articles.

Vasilevskiy, V. I. (Fiziko-khimicheskiy institut imeni L. Ya. Karpova, Physicochemical Institute imeni L. Ya. Karpov). Mechanism of Electrochemical (Electrolytic) Oxidation of Electrodes 241

Kabanov, B. N. (Institute of Electrochemistry, Academy of Sciences, USSR). Mechanism of Oxygen Evolution at Oxide Electrodes 252

Illimov, N. B., and Ye. I. Yakovleva. Study of the Mechanism of the Electrochemical Formation of Oxygen Compounds of Chlorine by the Anodic Polarization Method 257

Endrey-Gruz, Tibor, and Imre Shafarik (Bolsheest. Universitet, Budapest). Influence of Cations on Oxygen overvoltage 263

Transactions of the Fourth Conference (Cont.) SOV/2216  
Krasil'shchikov, A. I. (Gosudarstvennyy institut azotnoy promyshlennosti - State Institute of the Nitrogen Industry). Electrochemical Reactions of Oxygen 272

Garkavich, N. I. (Detal'skiy, and P. I. Krasnovich (Moscow State University). Study of the Mechanism of Some Anodic Processes by Combining Electrochemical and Tagged-Atom Methods 277

Shlygin, A. I., and G. A. Bogdanovskiy (Moscow State University). Mechanism of the Electrochemical Oxidation of Some Compounds on Platinum 282

Khomyakov, V. O., M. G. Buzhicharskiy, and A. E. Tomilov (Moskovskiy khimiko-tekhnologicheskii institut imeni D. I. Mendeleeva-Moscow Institute of Chemical Technology imeni D. I. Mendeleeva). Mechanism of the Electrolytic Oxidation of Acetone in Alkaline Solutions 287

Khomutov, M. Ye. (Moscow Institute of Chemical Technology imeni D. I. Mendeleeva). Mechanism of Some Irreversible Electrode 287

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KABANOV, B. N.

PHASE I BOOK EXPLOITATION NOV/22/16

5(4)

1956.

Sovetskoye po elektrokhemii. 4th, Moscow, 1956.

Trudy... (Transactions of the Fourth Conference on Electrochemistry. Collection of Articles) Moscow: Izd-vo AN SSSR, 1959. 868 p. Errata slip inserted. 2500 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Otdeleniye khimicheskikh nauk.  
Editorial Board: A. M. Frankin (Resp. Ed.), Academician, O. A. Yasin, Professor, S. I. Zhurav (Resp. Secretary), B. N. Kabanov, Professor, S. I. Zhurav (Resp. Secretary), B. N. Kabanov, Professor, Ya. M. Kolygin (Ed.), Doctor of Chemical Sciences, V. V. Loev, D.D., Lukovtsev, Professor, Z. A. Solov'yeva, V. V. Stander, Professor, and G. M. Plaplanovich; Ed. of Publishing House: M. O. Iegorov; Tech. Ed.: T. A. Frusakova.

PURPOSE: This book is intended for chemical and electrical engineers, physicists, metallurgists and researchers interested in various aspects of electrochemistry.

COVERAGE: The book contains 127 of the 138 reports presented at the Fourth Conference on Electrochemistry sponsored by the Department of Chemical Sciences and the Institute of Physical Chemistry, Academy of Sciences, USSR. The collection pertains to different branches of electrochemical kinetics, double layer theories, electrochemical processes in metal electrodeposition and industrial electrolysis. Abstracts of reports are given at the end of each section. The majority of reports not included here have been published in periodical literature. No personalities are mentioned. References are given at the end of most of the articles.

Saretsky, G. A., I. G. Zhuravitskiy (Deceased), and T. A. Jordanova. Anodic Behavior of Manganese and Its Alloys 733

Razina, M. P. (Dnepropetrovskiy khimiko-tekhnologicheskii institut imeni P. P. Dzerzhinskogo, Institut khimii AN KazSSR, Dnepropetrovsk, U.S.S.R.) Institute of Chemical Technology imeni P. P. Dzerzhinskogo, Institute of Chemistry, Academy of Sciences, KazSSR. Electrode Processes at a Lead Anode and Zinc Corrosion During the Electrolysis of Sulfuric Acid Solutions 729

Discussion (P. P. Tsyb and contributing authors) 732

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Kasparov, Ya. B., E. G. Yampol'skaya, and B. N. Kabanov. Role of Barium Sulfate in the Negative Plate of a Lead Battery 748

Kozlov, I. I., and V. I. Barilenko. Mechanism of the Loss of Efficiency in the Active Material of the Positive Electrode of a Lead Battery 757

Kuznetsov, Ya. V., E. S. Vaynsberg, and B. N. Kabanov. Investigating a Lead Brattice-Electrode for Potential Drop and Oxygen Evolution 762

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Kuznetsov, I. A. (Vsesoyuznyy nauchno-issledovatel'skiy institut tekhnicheskoy toke-all-Union Scientific Research Institute of Electric Power Sources). Growth of Zinc Dendrites in Some Swelling Polymers

Plarov, V. M. (Dor'kovskiy politekhnicheskii institut imeni

Card 30/34



AUTHORS: Popova, T.I., Kabanov, B.N. . SOV/80-32-2-16/56

TITLE: Mechanism of the Sulfating of Lead Storage Cells and Methods of Its Elimination (Mekhanizm sul'fatatsii svintsovykh akkumulyatorov i metody yeye ustraneniya)

PERIODICAL: Zhurnal prikladnoy khimii, 1959, Vol XXXII, Nr 2, pp 326-336 (USSR)

ABSTRACT: For the study of the sulfating mechanism of negative plates of a sulfuric acid lead storage cell the polarization method has been developed for determining the rate of lead sulfate dissolution. Sulfating is due to the adsorption of surface-active substances on the surface of lead sulfate crystals which impedes the dissolving of crystals. In the presence of substances which are well adsorbed on lead the loading of the negative plates is hampered which is explained by a blocking of the surface of the spongy lead. In the absence of surface-active substances the negative electrode may remain in the discharged state for a long time without the loading being impeded, i.e. without sulfating. The polarization method developed here may also be used for the analysis of organic compounds, like separators etc, in order to determine admixtures which are

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SOV/EO-32-2-16/56

Mechanism of the Sulfating of Lead Storage Cells and Methods of Its Elimination

detrimental to the negative electrode. Sulfated plates may be regenerated by removing the adsorbed substance using a strong cathode polarization.

There are 9 graphs, 1 diagram, and 11 references, 4 of which are Soviet, 4 English, 2 German, and 1 American.

SUBMITTED: April 29, 1957

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5.4600

75695  
SOV/80-32-10-44/51.

AUTHORS: Vaysberg, E. S., Krivolapova, Ye. V., Kabanov, B. N.

TITLE: Brief Communications. Effect of Sb on the Character of Pb Passivation in  $H_2SO_4$  Solutions

PERIODICAL: Zhurnal prikladnoy khimii, 1959, Vol 32, No 10, pp 2354-2357 (USSR)

ABSTRACT: The effect of Sb on the process of passivation of the negative lead electrode in lead-acid storage batteries was studied. A sharp decrease in the capacity of the negative electrode (by Sb poisoning), is usually attributed to its inability to charge fully. The experiments show that due to the corrosion of the anode lead-antimony electrode during discharging, Sb migrates to the negative electrode and promotes the passivation of the latter. Thus, it is wrong to attribute the decrease in the technological capacity of the negative electrode, only to the decrease in the degree of its charging. There are 2 figures; and 8 references, 4 Soviet, 3 British, 1 U.S. The English language references are: Crennell and Milligan, Trans.

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5(4)

AUTHORS: Birintseva, T.P., Kabanov, B.N.

SOV/76-33-4-15/22

TITLE: Investigation of the Adsorption of Anions on Platinum  
by the Alternating Current Method (Issledovaniye  
adsorptsii anionov na platine metodom peremennogo toka)

PERIODICAL: Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 4, pp 844 - 851  
(USSR)

ABSTRACT: In the work reported in the present paper the method of  
impedance measurement (I) was used since it offers the  
advantage of a simultaneous determination of the influence of  
anionic adsorption on the reaction  $H_{ads} \rightleftharpoons H^+ + e^-$  (2) and on  
the capacity of the binary layer. In the case of potentials  
above those of the reversible hydrogen electrode practically  
only reaction (2) takes place on platinum so that a certain  
scheme may be applied for the preparation of (I) of the  
Pt-electrode (Fig 1). In the present case the (I) of the  
Pt-electrode was carried out at frequencies of 50 ° to 50 kc  
and a 0.1 thick and 2-3 mm long Pt-wire was used as electrode.  
The capacity and conductivity of the Pt-electrode were measured  
in 1n  $H_2SO_4$ , 1n HCl, 1n HBr and 1n  $H_2SO_4$  + 0.1n KJ as a

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Investigation of the Adsorption of Anions on  
Platinum by the Alternating Current Method

SOV/76-33-4-15/32

function of the potential, of the alternating current frequency, and of time. With the increase in frequency, capacity decreases (Fig 3) and conductivity increases. The experimental results show that the  $J^-$ -ions strongly inhibit the ionization of the adsorbed hydrogen (2) while the  $Cl^-$  and  $Br^-$ -ions for some hours accelerate the ionization reaction (with respect to the process in  $H_2SO_4$ ); after some time,

however, they also begin to inhibit the ionization. This inhibition is explained by the strengthening of the platinum-halide bond in the course of time and by a resulting change of the platinum surface. In the case of the  $J^-$ -ionic adsorption the capacity of the double layer on platinum decreases (Fig 5). It is assumed that the  $J^-$ -ions so rigidly adhere to the platinum surface that they do no longer react to potential changes. In conclusion A. N. Frumkin is thanked for valuable advice. There are 8 figures and 15 references, 13 of which are Soviet.

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Investigation of the Adsorption of Anions on  
Platinum by the Alternating Current Method

SOV/76-33-4-15/32

ASSOCIATION: Akademiya nauk SSR, Institut fizicheskoy khimii, Moskva  
(Academy of Sciences USSR, Institute of Physical Chemistry,  
Moscow)

SUBMITTED: September 23, 1957

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5(4)

SOV/20-124-4-35/67

AUTHORS:

Vidovich, G. L., Leykis, D. I., Kabanov, B. N.

TITLE:

The Anodic Passivation of Silver in Alkali Solutions  
(Anodnaya passivatsiya serebra v rastvorakh shchelochi)

PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 4, pp 855-857  
(USSR)

ABSTRACT:

The present paper investigates the passivation of silver in solutions of KOH in the concentration interval of from 0.01 n to 10 n according to the method of measuring the capacity and the ohmic components of the impedance of the electrode at constant current density or constant potential. Impedance was measured by employing the compensation method. If a low positive potential (0.3 v against the oxide-mercury electrode in the same solution) is applied, the dissolution rate of the silver decreases rapidly, and, at the same time, also the capacity of the double layer of the electrode is reduced. These considerable modifications of the intensity of the dissolving current and of the electrode capacity occur during the passage of a smaller quantity of electricity ( $\sim 20$  millicoulomb  $\text{cm}^2$ ), which corresponds on the average to about 10 molecular layers of  $\text{Ag}_2\text{O}$ . The capacity decrease

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The Anodic Passivation of Silver in Alkali Solutions

is apparently connected with the semiconductor properties of the  $\text{Ag}_2\text{O}$ . Here it is assumed that the  $\text{Ag}_2\text{O}$ -layer formed covers the electrode in a relatively uniform manner. The data discussed indicate the following: At the very beginning, before a compact  $\text{Ag}_2\text{O}$ -layer is formed on the surface, a solution with primary formation of an oversaturated solution and with a following deposition at the centers of crystallization is formed. After the formation of a compact  $\text{Ag}_2\text{O}$ -layer on the surface of the silver, the  $\text{Ag} \rightarrow \text{Ag}_2\text{O}$  process apparently develops on the boundary between two solid phases. During the formation of the compact  $\text{Ag}_2\text{O}$ -layer the rate at which the process  $\text{Ag} \rightarrow \text{Ag}_2\text{O}$  develops decreases considerably. This is described by the authors as the first stage of passivation. However, the process develops only during a limited period at this reduced rate. In the case of constant amperage the potential increases considerably after a certain interval of time, and the second stage of passivation begins. At the same time, slowing down of the electrochemical process  $\text{Ag} \rightarrow \text{Ag}_2\text{O}$  as a whole increases rapidly. At this stage this is probably the electrochemical adsorption of oxygen on the surface of

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The Anodic Passivation of Silver in Alkali Solutions

the silver, similar as is the case in the solution and passivation of iron in a lye. These as well as other results discussed here lead to the following conclusion: The anodic passivation of silver in lye takes place in three successive stages, and in each of these stages the rate of oxidation decreases rapidly. The investigation of the mechanism of these stages of passivation is being continued. There are 2 figures and 5 references, 4 of which are Soviet.

ASSOCIATION: Institut elektrokhemii Akademii nauk SSSR  
(Institute for Electrochemistry of the Academy of Sciences, USSR)

PRESENTED: October 1, 1958, by A. N. Frumkin, Academician

SUBMITTED: September 11, 1958

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5 (1,2)

AUTHORS:

Astakhov, I. I., Kiseleva, I. G.,  
Kabanov, B. N.

SOV/20-126-5-35/69

TITLE:

The Polymorphism of Lead Dioxide and the Structure of the  
Electrolytic Deposits (Polimorfizm dnuokisi svintsa i stroyeniye  
elektroliticheskikh osadkov)

PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 5, pp 1041 - 1043  
(USSR)

ABSTRACT:

According to various publication references, there are 2 different crystalline  $PbO_2$ -modifications: a) a rhombic ( $\alpha$ ), and b) a tetragonal ( $\beta$ ) modification which have different mechanical and physical properties. As is known,  $\alpha$ - $PbO_2$  has a slightly higher density (Ref 1). Also the hardness of the  $\alpha$ -modification is higher (Ref 2). The deposit of the  $\alpha$ - $PbO_2$  is said to be more compact (Ref 3). It is known that the mechanical and physical properties of the deposits depend on their structure (Ref 4). Publication references on this subject are very poor. The authors investigated these deposits for gold under the electron microscope (magnification 11,000). (The electrochemi-

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The Polymorphism of Lead Dioxide and the Structure of the Electrolytic Deposits SOV/20-126-5-35/69

cal preparation of the deposits was made by P. I. Tyaglova). Figure 1 shows a deposit of the rhombic  $PbO_2$ -modification which really forms more compact deposits. The looser deposits of the tetragonal modification are shown in figure 2. The authors put forward analogies among other chemical compounds (Ref 5) and discuss the presumable causes of the phenomenon in question (Refs 1, 6). The authors think it correct to explain the formation of different  $PbO_2$ -modifications not by the origin of 2 different complexes in the solution, but by the adsorption phenomena on the surface of the growing crystals. Figure 3a shows a microphotograph of the  $PbO_2$ -deposit produced by oxidation of the lead sulphate in 0.01 n  $H_2SO_4$ . It is very similar to the one from a neutral solution (Fig 1).  $\alpha$ - $PbO_2$  can be obtained by reducing the adsorption of the  $H_2SO_4$ . This is possible by the admixture of  $CoSO_4$  (Ref 8) (Fig 3b). The  $\alpha$ - $PbO_2$ -deposits represented in figure 3 are contradictory to the opinion

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(Refs 1,6) that only the  $\beta$ - $\text{PbO}_2$ -modification can be obtained by  $\text{PbSO}_4$ -oxidation. The different strength of the deposits of the two modifications is practically of great interest (e.g. for the massive electrodes in hydrometallurgy). Finally, the strength of the positive plates in a lead accumulator is discussed. Barium sulphate destroys the solid structure of the lead dioxide (comparison between figures 3a and 4a). There are 4 figures and 9 references, 5 of which are Soviet.

ASSOCIATION: Institut elektrokhemii Akademii nauk SSSR (Institute of Electrochemistry of the Academy of Sciences, USSR)

PRESENTED: March 21, 1959, by A. N. Frumkin, Academician

SUBMITTED: March 25, 1959

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KABANOV, B. N.

66180

5(4) 5.4600

SOV/20-128-5-34/67

AUTHORS:

Voropayeva, T. N., Deryagin, B. V.,  
Corresponding Member, AS USSR, Kabanov, B. N.

TITLE:

An Investigation of the Interaction of Crossed Polarized Metallic Filaments in Electrolyte Solutions for the Modeling of Coagulation Phenomena and Measurement of the Zero-charge Potential and the Constant of the van der Waals Forces

PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 128, Nr 5, pp 981-984 (USSR)

ABSTRACT:

Direct experiments (Ref 1) and the theory of the durability of lyophobic colloids indicate that repulsive forces act between charged surfaces in electrolyte solutions which, at distances of the order of ion sheaths, may be stronger than molecular attractive forces. In order to bring two crossed filaments into direct electric contact, a certain energy threshold  $E_m$  is to be surpassed. This process may easily be seen from the abrupt drop of electric resistance between the two filaments as soon as contact has been established. Such measurements were made by the authors by means of platinum filaments  $300\mu$  thick (Fig 2). One filament was pivoted, loaded with a weight whose angle of rotation

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An Investigation of the Interaction of Crossed Polarized  
Metallic Filaments in Electrolyte Solutions for the Modeling of Coagulation  
Phenomena and Measurement of the Zero-charge Potential and the Constant of the  
van der Waals Forces

was recorded on a photoelectric relay by means of a mirror. With the help of a motor and mechanical gears the other filament was shifted slowly and continuously toward the first filament. The wires were placed in a hermetically sealed vessel which was filled with the electrolyte to be investigated. A circuit diagram in figure 3 demonstrates the manner in which the two wires are charged to a certain potential. The article further gives a detailed description of the cleaning of the wires and the vessel as well as of the polarization of the wires. As soon as the first wire had sufficiently approached, the second wire began to turn aside by rotation. A galvanometer indicated the passage of the energy threshold and the establishment of contact. The angle of rotation of the first wire at that instant was a measure of the amount of  $N_m$ . The latter was measured at various potentials in KCl solutions of a concentration of  $10^{-3} N$ ,  $10^{-2} N$ , and  $10^{-1} N$ . Results are given in figure 4. At the potential  $0.2 \pm 0.02 \text{ v } N_m$  passes through a minimum the ordinate of which is independent of

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An Investigation of the Interaction of Crossed Polarized SOV/20-128-5-34/67  
Metallic Filaments in Electrolyte Solutions for the Modeling of Coagulation  
Phenomena and Measurement of the Zero-charge Potential and the Constant of the  
van der Waals Forces

the concentration. The constant of molecular attraction was  
computed with the help of a formula deduced by the second-mentioned  
author (Ref 3) for the action of hydrophobe, curved surfaces in  
electrolytic solutions:  $A = 6.6 \cdot 10^{-12}$  erg for an electrolyte  
concentration of  $10^{-3}$  mol/l, and  $A = 7.3 \cdot 10^{-12}$  erg for a concentra-  
tion of  $10^{-2}$  mol/l. The theoretical dependence of  $\Pi_m$  on the

potential is illustrated in figure 4. The deviation of the  
experimental curves indicates the presence of neglected forces of  
a third kind. The value  $0.2 \pm 0.02$  v corresponds to the platinum  
zero charge. The method suggested is therefore suited also for  
measuring metal zero charges. In conclusion, mention is made of  
an article by A. N. Frumkin (Ref 6) on electrostatic repulsion of  
films. There are 4 figures and 8 references, 7 of which are Soviet.

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ASSOCIATION: Institut elektrokhimii Akademii nauk SSSR (Institute of  
Electrochemistry of the Academy of Sciences, USSR) and Institut fizi-  
cheskoy khimii Akademii nauk SSSR (Institute of Physical Chemistry of  
the Academy of Sciences, USSR)

SUBMITTED: June 30, 1959

4

86781

S/076/60/034/011/009/024  
B004/B064

26.1610  
AUTHORS:

Kokoulina, D. V. and Kabanov, R. N. (Moscow)

TITLE:

Formation of Monovalent Magnesium and Passivation of the Magnesium Anode

PERIODICAL:

Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 11,  
pp. 2469-2479

TEXT: In the introduction, the authors discuss the characteristics of the anodic dissolution of magnesium mentioned in publications. The principal purpose of the present work was to clarify the mechanism of this dissolution and study the effect of the potential and the degree of oxidation of the electrode surface upon the course of dissolution and the evolution of hydrogen. The following problems were studied: 1) polarization of the magnesium anode in 1 N solutions of  $\text{MgCl}_2$ ,  $\text{MgSO}_4$ ,  $\text{KClO}_3$ ,  $\text{K}_2\text{CrO}_4$ ; change in time of the anode potential in 1 N  $\text{MgSO}_4$ , 1N  $\text{MgSO}_4 + 0.05 \text{ M K}_2\text{CrO}_4$ ; 3) capacity of the double layer of the magnesium electrode in  $\text{MgCl}_2$ ,  $\text{MgBr}_2$ ,  $\text{MgSO}_4$ ,  $\text{MgSO}_4 + \text{K}_2\text{CrO}_4$ ; evolution of hydrogen on the magnesium electrode

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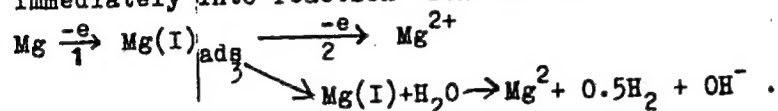


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Formation of Monovalent Magnesium and  
Passivation of the Magnesium Anode

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in solutions of  $\text{MgSO}_4$ ,  $\text{MgBr}_2$ ,  $\text{MgCl}_2$ ,  $\text{CaCl}_2$ ,  $\text{NH}_4\text{Cl}$ ,  $\text{HCl}$ ,  $\text{KClO}_3$  at constant and pulsating currents of between 6 and 100,000 cps; 5) real valence  $n_1$  of the magnesium ions forming on the anode; 6) formation of  $\text{Mg(I)}$  ions and their detection. The results led to the following conclusions: Primarily monovalent Mg ions form at the anode which, however, enter immediately into reaction with water:



The increasing evolution of hydrogen at the anode with an increase of current density is not due to the accelerated self-dissolution of the anode, but to the intensification of reaction 3. The oxidation of  $\text{Mg(I)}$  to  $\text{Mg}^{2+}$  at the anode is facilitated by an increasing potential. The effect of the composition of the solution upon the relative rates of oxidation at the electrode and in the solution manifests itself by a shift of the anode potential in the positive direction while the anode is passivated. All these relations may be expressed by the following

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Formation of Monovalent Magnesium and  
Passivation of the Magnesium Anode

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equations:  $v = v_1 + v_2 = 6.95i_a(2 - n_1)/n_1 + v_o \exp(-\alpha_1 \Delta \phi F/RT)$  (1); or  
 $v = 6.95i_a(2 - n_1)/n_1 + v_o^2/6.95i_a' \approx 6.95i_a(2 - n_1)/n_1 + v_o^2/(v_o + 6.95i_a)$   
 $\text{cm}^3/\text{cm}^2 \cdot \text{min}$  (1a).  $v_1$  is the rate of oxidation of  $\text{Mg(I)}$  to  $\text{Mg}^{2+}$ ;  $v_2$  is the  
rate of hydrogen evolution at the cathode;  $i_a$  is the current density at the  
anode;  $v_o$  is the rate of hydrogen evolution without polarization;  $\alpha_1$  is  
a coefficient characterizing the cathodic process of hydrogen evolution;  
 $\Delta \phi$  is the potential shift in the positive direction;  $i_a'$  is the actual rate  
of the anodic process. There are 7 figures, 1 table, and 18 references:  
8 Soviet, 8 US, 1 British, 1 Canadian, 5 German, and 1 Italian.

ASSOCIATION: Akademiya nauk SSSR, Institut elektrokhemii (Academy of  
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B004/B007

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AUTHORS: Popova, T. I., Bagotskiy, V. S., Kabanov, B. N.  
TITLE: Anodic Passivation of Zinc in Alkaline Solutions  
PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 132, No. 3,  
pp. 639-642

TEXT: It was the aim of this paper to investigate the influence exerted by the adsorption of oxygen and by the formation of an oxide film upon the passivation of zinc. The anodic behavior of Zn was investigated in KOH by means of oscillographic recording of the potential - time curve  $\varphi(t)$  at constant current density  $i$  on a rotating disk electrode.  $Q_{\text{pass}}$  -  $i t_n$  was determined ( $Q_{\text{pass}}$  is the amount of electricity necessary for passivation,  $t_n$  is the time up to passivation). Fig. 1 shows the diagram  $1/Q_{\text{pass}} = f(i)$ . At mean current densities there is a linear dependence between  $1/Q_{\text{pass}}$  and  $i$ . In the case of  $i$  being low,  $Q_{\text{pass}}$  becomes dependent on the rate of stirring, and in the case of a very low  $i$  and a high rate

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B004/B007

of stirring, no passivation occurs. From these results as well as from the anodic polarization curve (Fig. 2), the curve of the increase of the potential after 60-min passivation and after switching off the anode current (Fig. 3) as well as from the dependence of the dissolution rate of the passivated electrode on the speed of rotation (Fig. 4) the authors draw the following conclusions: The dissolution of zinc depends on the dissolution rate of the zinc oxide (and peroxide). As passivation occurs already at potentials (-1.1 to -1.0 v), which are more negative than the reduction potential of the zinc peroxide in the oxide film, passivation is primarily based on a change in the concentration of KOH and the zincate retarding dissolution in the liquid layer near the electrode. The formation of the oxide film is a secondary process. There are 4 figures and 7 references: 4 Soviet, 2 German, and 1 Indian.

ASSOCIATION: Institut elektrokhemii Akademii nauk SSSR (Institute of  
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PRESENTED: January 25, 1960, by A. N. Frumkin, Academician

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